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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/405,210

09/24/1999

BRUCE D. MARCHANT

18865-32US

9239

20350

7590

12/17/2003

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EXAMINER

VU, DAVID

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 12/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/405,210	MARCHANT ET AL.	
	Examiner	Art Unit	
	DAVID VU	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 6-8, 12-15 and 18-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 6-8, 12-15 and 18-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>20</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-3, 6-8, 12-15 and 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kwan et al., (US 5,665,619) in view of Huang (US 6,037,628).

Regarding claims 1-3, 6-8, 12-15 and 18-21, Kwan et al., in related text (Col. 2, Line 39-Col. 3, Line 37 and Col. 4, Lines 20-25) and figures (Figs. 1A-1F) disclose a process for manufacturing a trench field effect transistor comprising the steps of etching a first trench 18 in a substrate having a first conductivity type; lining the first trench with a layer of dielectric material 20; substantially filling the first trench with polysilicon 22; implanting impurities of a second conductivity type into the substrate to form a body region 26 having the second conductivity type over the substrate ; after substantially filling the first trench with polysilicon 22, implanting impurities of the first conductivity type inside the body region 26 to form a source region 28 adjacent to the first trench 18; oxide spacers 30 are formed to self-align the source and body contacts to the trenches 18; the oxide spacer 30 defining the separation between the source and body contact to the trench edge so that the source and body contact is self-aligned to the trench

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edge (Fig. 1E). Next, a layer of aluminum is deposited to form the top layer metal 34 (Fig. 1F); a photoresist mask is used to delineate the top layer metal 34 for the source and gate area.

Kwan et al. fails to expressly mention the second trench is etched through the source region and into the body region.

Huang, in related text (Col. 2, Lines 31-51 and Col. 4, Lines 21-24) and figures (Figs. 8-9; 11 and 13) discloses the second trench terminates in contact with the body region. The second trench is etched through the source region 16 and into the body region 14, the second trench defined by sidewalls and a bottom, which terminates in contact with the body region 14/35; and filling the second trench with metal 36 making contact with both the source region 16 and the body region 14/35. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have shallower second trench as taught by Huang, making it possible for the MOSFET to break down at the PN junction 35 and protect the trench gate 26 (See Huang, Fig. 13).

Response to Arguments

2. Applicant's arguments filed 11/21/03 have been fully considered but they are not persuasive.

It is argued, at page 6 of the remarks, that Huang (U.S. Patent No. 6,037,628) fails to anticipate the present invention because "the bottom of the trench terminates in contact with a heavily doped (P+) impurity region 35", trench 34 does not terminate in contact with the body region. Note that Figure 11 of Huang clearly shows a heavily doped (P+) impurity region 35 is a

part of the body region 14. Therefore sidewalls and a bottom of the second trench terminates in contact with the body region.

With regard to applicant's argument concerning Fig. 9, see Applicant Remark, November 21, 2003, page. 6, lines.1-3, the Examiner maintains that trench (34) terminates in contact with P-region (14). Merriam-Webster's Collegiate Dictionary defines terminate as " an ending, limit, or boundary". Since trench 34's sidewalls act as a boundary to p-region (14), they are definitional terminating in contact with the body region. Therefore, the rejection of claims 1-3, 6-8,12-15 and 18-21, as stated in the previous Office Action is maintained.

Conclusion

3. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Vu whose telephone number is (703) 305-0391. The new phone number after January 08, 2004 will be (571) 272-1798. The examiner can normally be reached on Monday-Friday from 8:00am to 5:00pm.

If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms., can be reached on (703) 308-4910. The new phone number after January 08, 2004 will be (571) 272-1787.

DV

David Vu.


David Nelms
Supervisory Patent Examiner
Technology Center 2800